

# Future of Aviation Noise Management – Case for Change

## Operating conditions and operational procedures at UK airports

### Summary

There are different operational noise management procedures in place at airports in the UK. We seek to identify how these initiatives are managed and enforced at airports, the roles of the various stakeholders in that process, the influence of the International Civil Aviation Organisation (ICAO) and other international stakeholders, known challenges and issues and how these management initiatives may change in the future.

There are different noise management initiatives related to noise, for example guidance around the minimum height and distance that aircraft should join the final approach or Instrument Landing System (ILS) along with the use of Continuous Descent Approach (CDA) procedures.

While international, continental, national and local regulations are used to manage noise, it is also important to note that the UK aviation industry, through groups such as Sustainable Aviation, has also taken steps to drive the development of best practice, including the production of codes of practice to better manage noise from arriving and departing aircraft.

With respect to the future, the challenge facing the industry is recovery from the COVID-19 pandemic from both an economic and social perspective. Reviews of the recovery and changes will progress with the introduction of new, more modern aircraft types, new air traffic control technology and techniques along broader and wholesale changes to the industry through the introduction of low-carbon aircraft, Unmanned Aerial Vehicles (UAV) and Urban Air Mobility (UAM). There is an opportunity to build back quieter as well as build back better.

For this case for change ICCAN is focusing on operating issues such as continuous descent approach and noise preferential routes. We understand that there are other issues that are not included, such as night curfews, preferential runway use, movement caps, continuous climb operations and ground noise. Operating procedures and conditions are complex with multi-faceted initiatives and approaches taken across the country.

In addition, ICCAN understands that safety is the priority in all operations. It is sometimes difficult to achieve or comply with certain noise measures due to various operating and weather conditions, for example warmer weather which may reduce aircraft climb performance, where this shall not be recognised as non-compliance.

## Key issues

### Arrival Noise Measures

- **Continuous Descent Approach (CDA)**

CDA is a recognised practice for managing arrivals noise in the UK. It is an aircraft operating technique in which the arriving aircraft will descend from an optimal position using minimum thrust and avoiding level flights and thereby reducing noise. ([Eurocontrol, 2016](#)).

#### Concerns

CDA can be used to reduce arrival noise by having the aircraft flying higher for a longer time period and avoiding level flight during the approach. There are different operational procedures, weather and flight conditions that may limit the use of CDA.

#### Improvement opportunities

Current airspace design and operational procedures can limit the attainment of CDA. However, the re-design of the London airspace and new procedures may allow the sector to build back better and quieter, led by airlines to reduce cost and fuel burn but also reducing noise and other environmental impacts.

- **Low Power / Low drag (LP/LD)**

Low power/ Low drag typically refers the noise abatement technique for arriving aircraft in which the pilot delays the extension of the wing flaps and landing gear during the approach, subject to compliance with ATC speed control requirements and the safe operation of the aircraft.

#### Concerns

Measurement and tracking of LP/LD is challenging and often results in wide variation between airlines and aircraft type. There are a number of procedures at airports that are based on historic consent or agreement that may be ineffective in the current environment and are no longer the best approach. There are also potential issues with measurement and enforcement for these procedures.

#### Improvement opportunities

Where safety is not jeopardised, airlines could be encouraged to work with their pilots to optimise deploying the landing gear and flaps to save fuel as well as to seek ways to gather evidence on how this has been done.

### Departure Noise Measures

- **Noise infringements and the 1,000ft rule**

The 1,000ft rule as stated by the UK AIP is, *“After take-off, the aircraft shall be operated in such a way that it is at a height of not less than 1000 ft aal at 6.5 km from start of roll as measured along the departure track of that aircraft.”*

#### Concerns

Noise monitoring terminals are usually placed at 6.5km from start of roll, however this is not mandatory at all airports. In addition, the certification point of the terminals may not be near any residential communities.

#### Improvement opportunities

A review of the effectiveness of the 1000ft rule should be considered. In addition, there is an opportunity to update the noise infringement issue within the CAA’s CAP 1691 ([2018](#)).

- **Noise Preferential Routes (NPRs)**

In the early 1960s, the concept of NPR was established at a few major airports in the UK. Aircraft are required to fly these routes at certain airports as the initial part of the departure procedure. These routes were designed to minimise the noise footprint on the ground.

#### Concerns

Adherence to these routes may be limited by different operational constraints and may require certain equipment such as Noise and Track Keeping system (NTK) to monitor and enforce the NPRs.

#### Improvement opportunities

Track keeping compliance is generally very high with some exceptions. One of which is Heathrow 09RCPT NPR which conflicts with arriving aircraft ([Heathrow Airport Limited, 2021](#)). New technology tools such as airline compliance can help to improve track keeping performance.

### Night noise measures

- **Night noise restrictions**

#### Concerns

There are concerns on whether dispensations are applied across the airports in the same manner. The COVID-19 pandemic is having a significant impact on the aviation sector, there's on-going discussion on how to find the right balance as the industry recovers.

#### Improvement opportunities

Government is consulting on night flights ([UK Government, 2021](#)). The first stage closed on 3rd March 2021, so too early for review here. There is ongoing public consultation in Stage 2. ICCAN will be working with a range of stakeholders to inform its response to this consultation.

# Supplementary information

## Arrival Noise Measures

- **Continuous Descent Approach (CDA)**

### Concerns

The delivery of an effective and efficient CDA requires a partnership between the flight crew and the air traffic controller. Aircraft technology has evolved but even quieter aircraft can be operated in a way that doesn't minimise noise to communities. For a CDA to be executed, other factors need to be considered including, airline procedures, aircraft performance and flight conditions, other airspace operations (i.e. other air traffic in close proximity) and atmospheric conditions (i.e. the influence of wind directions). Generally, in the UK, the flight paths for CDA could vary depending on various operational conditions at each airport.

### Current approach and limitations

Improvements to CDA and technology, including real time feedback to ATC and flight crew can improve compliance. This is a resource intensive process and one which will be challenging for airports who had redundancies during the COVID-19 pandemic.

### Opportunities for improvement and challenges

Research by Gatwick Airport and its Noise Management Board identified that the current definition of CDA is broad and could class an aircraft as performing a CDA when it may not be the lowest noise approach. This research led to the development of a low noise approach metric. There are also opportunities for individual airports to consider increasing the minimum altitude for the commencement of CDA.

- **Low Power / Low drag LP/LD**

### Concerns

Measurement and tracking of LP/LD is challenging and attempts to track this have involved attended site surveys which have shown a wide variation in the point at which the landing gear are deployed, with wide variation noted between both airlines and aircraft types. ICCAN recognises that LP/LD also includes other devices, such as flaps. CAA has showed evidence that selecting more flaps than required produces more noise however the effect is small, it's typically less than 1dB. On the other hand, deploying landing gear significantly increases airframe and engine noise where the combined effect may be as much as 5dB ([CAA, 2017](#)).

### Current approach and limitations

With a limited data set engagement with airlines may become difficult. It is also relatively difficult to precisely determine the deployment of flaps without analysing onboard flight data, this may only be possible with some airlines. Determining the deployment of landing gear is relatively more straightforward however the deployment procedures could vary between airlines and aircraft types.

### Opportunities for improvement and challenges

Where safety is not jeopardised, airlines could be encouraged to work with their pilots to optimise deploying the landing gear and flaps to save fuel as well as to seek ways to gather evidence on how this has been done.

## Departure Noise Measures

- **Noise infringements and the 1,000ft rule**

### Concerns

Airports with NTK systems monitor compliance with the 1,000ft rule. As older aircraft have slowly been removed from service and being replaced by modern aircraft, the number of violations has dropped over the years ([CAA, 2018](#)).

Monitors are usually placed at 6.5km from start of roll however this might not capture the noise impacts as the certification point may not be near any properties where inhabitants may live.

### Current approach and limitations

At certain airports the UK AIP, for example: Heathrow UK AIP EGLL AD 2.21 and Gatwick EGKK AD 2.21 (3(1)) listed the 1,000ft rule as: After take-off, the aircraft shall be operated in such a way that it is at a height of not less than 1000 ft aal at 6.5 km from start of roll as measured along the departure track of that aircraft.”

As larger and slowing climbing four-engine aircraft have slowly been removed from service, being replaced by more modern aircraft, the number of violations has dropped significantly.

Noise Infringement limits are defined at 6.5km from start of roll as this is part of the aircraft’s certification process and airports will place noise monitoring terminals at that position where possible. It could be more challenging to deploy additional monitors along the route in some urban areas. Furthermore, the certification point may not be free from obstructions such as buildings or other non-aircraft background noise. Also, it may not be near any residential communities, therefore infringement limits may not relate to where communities live. Noise levels generally diminish along the track of the aircraft after it has passed the monitor at 6.5kms and at positions laterally displaced from the track ([CAA, 2018](#)). In addition, Noise Monitoring Terminals are expensive and require routine calibration and maintenance which adds to operating costs and limits the number of monitoring points.

### Opportunities for improvement and challenges

The 1,000ft rule stems from the desire to increase the distance, and therefore decrease the noise exposure, between the aircraft and the recipient at the point at which an aircraft passes over the departures noise monitoring station. This is a long-standing requirement, brought in when the aircraft operating was very different to the modern aircraft fleets of today. A review of the effectiveness of the rule should be considered.

The existing noise limits have been in place since 18 December 2003 and the current limits were set following a review which began 7 years earlier leading to community complaints of inaction. Moving away from, or supplementing, reporting the existing departures regimes that measures noise at a specific point the industry should explore a methodology that looks to see an optimised noise departure profile being flown to higher altitudes and monitoring of these with additional microphones under each NPR. As CAP 1691 recommended this three years ago, there is an opportunity update this issue within CAP 1691 with the CAA ([CAA, 2018](#)).

## Noise Preferential Routes (NPRs)

### Concerns

NPRs form the initial part of the Standard Instrument Departures (SIDs) and are currently operated at different airports in the UK. Adherence to these routes may be limited by different operational constraints.

### Current approach and limitations

A track exiting the NPR below its ceiling, either 3,000ft or 4,000ft depending upon NPR, is flagged as violation, and reporting and engagement can commence. Deviations are permitted and will not be followed up by the airport where such a deviation is under the direction of Air Traffic, for weather or traffic avoidance reasons.

NPRs are typically represented by nominal centre lines; variations in weather, technique or procedures could result in aircraft flying either side of the centre line and therefore creating a lateral swathe. Departing aircraft are required to comply with the NPRs and airports work with airlines to achieve this.

## Opportunities for improvement and challenges

While aircraft are not interpreted as breaching NPR instructions when flying outside of the swathes, airports shall encourage operators to adhere to the NPR as much as possible. NPR is currently an important and integral part of aviation noise management, how this is retained with airspace will be key for the industry, this will be reviewed again in the future.

## Night noise measures

### • Night noise restrictions

The Night Restrictions are a limit on the actual number of movements and a Quota Count (QC) mechanism, which was introduced in 1993. The Quota count system works by classifying aircraft into different bands, according to their noise certification data. The noisier the aircraft, the higher the band it is placed in. The QC mechanism acts as an incentive for operators to use the quietest appropriate type when operating during the core night period.

## Concerns

There are concerns on whether dispensations are applied across the airports in the same manner. The COVID-19 pandemic is having an enormous impact on the aviation sector, there's on-going discussion on how to find the right balance as the industry recovers.

## Current approach and limitations

Slots constrained airports are managed by ACL. The current system works on a seasonal basis, Summer and Winter, to tie into the different schedules of each season. Airlines that have had historic flights to arrive at an airport are each granted movements and QC points to operate those movements scheduled during the core-night period 2330-0600 local time. These flights are assigned an allocation to each airline by Airport Co-ordination Limited. Airlines that did not have historic slots are given a pool of movements to allow for late running arrivals and departures beyond 2330 local time. This pool is managed by the airport on behalf of those airlines ([Heathrow Airport Limited, 2020](#)).

The overall management of the regime lies with the airport operator. They manage the day to day reporting, liaison with airlines, airport operational staff, Air Navigation Service Provider (ANSP), and the Government.

Airports will look at the data daily and check the pro-rata numbers to ensure that an airline is not overusing its allocation and is not at risk of running out of allocated movements before the season ends. If the problem continues to get worse, then the airport has the power to refuse any further movements until the airline's situation is restored to the expected pro-rata number.

At designated airports, any flight that operates in the designated night time will either count against the airline, or airport allocation, and can be dispensed under Government guidelines. Although this applies to designated airport the approaches could have implications for both regulation and night activity at non-designated airports. The dispensation criteria are designed to discount a movement from an airline if the movement was caused by circumstances beyond the operator's control. The reasons for dispensation are outlined below.

## Emergencies

- Medical
- Diversion
- Low Visibility
- Risk to Life

## **Serious Airfield and Terminal Congestion**

- Hardship to Passengers
- Long Delays
- Terminal Overcrowded and Facilities Strained
- Insufficient Hotel Accommodation
- Hardship to Animals
- Single Runway Operations

## **Widespread and Prolonged ATC Delays**

- ATC Flow Restrictions
- Thunderstorms/Strong Winds
- Snow and Ice
- ATC Strike or Computer Problems

## **DfT Dispensation**

- Heads of State
- Royal Families (including Foreign)
- Senior Ministers on Official Business
- Relief Flights
- Civil Aircraft Affected by Hostilities
- Military Flights on Compassionate Grounds

All dispensations are subject to DfT audit as required.

## **Opportunities for improvement and challenges**

The UK Government is consulting on night flights. The first stage closed on 3rd March 2021, so too early for review here. There is ongoing public consultation in Stage 2. ICCAN will be working with a range of stakeholders to inform its response to this consultation.

## **Further areas for potential consideration**

### **• Joining point guidance**

#### **Concerns**

Often the aircraft will join the ILS at different point, it will vary in response to traffic volume along with a range of other factors such as weather. This results in a broad variation in the paths taken by aircraft approaching an airport, generating what is called the arrivals swathe. This can vary in position over the course of a day and may transition over time leading to community annoyance and concern.

This is not a result of the minimum joining point itself more a consequence of how Air Traffic manage the arrivals traffic. Whilst this can be measured using an NTK system, managing the swathe is extremely complex. There are a broad range of interconnected factors that cannot be directly targeted. A good example of the challenge is the Fair and Equitable Distribution discussion which has been a discussion point at the Gatwick Noise Management Board since its inception in 2017.

### **• Reverse thrust (or use of thrust reversers)**

#### **Concerns**

Reverse thrust involves diverting the thrust of an aircraft's engines to slow the aircraft on landing. Some airport's AIPs list a requirement for commanders of aircraft to limit the use of reverse thrust. For example, the Stansted airport entry states - "4. *To minimise disturbance in areas adjacent to the aerodrome, commanders of aircraft are requested to avoid the use of reverse thrust after landing, consistent with the safe operation of the aircraft, from 2330 hours to 0600 hours (local time)*". Whilst studies have been undertaken in the past, no routine monitoring

of reverse thrust takes place at airports and therefore there is little in the way of enforcement ([CAA, 2010](#))

- **Minimum climb gradient**

**Concerns**

In general, aircraft are required to maintain a climb gradient of not less than 4% after passing the 1000ft point. Tracking and monitoring this can be complex and require specific technology. Generally, there's high compliance at airports however assessment is often complex and resource heavy which may not be prioritized during the COVID-19 recovery period.

# Appendices

## Appendix I: Legislation

### The UK approach to noise management

#### Department for Transport

In the UK, overarching noise management policy is set through by the Department for Transport and it has a long history, tracing its roots back to the Air Navigation Act 1920 ([UK Statutory Instruments, n.d.](#)). This was the basis for the first UK aviation regulation regime, and it did this by exempting aviation from nuisance sanctions in order to stimulate the emerging industry.

This principle was reaffirmed in the Civil Aviation Act 1982 (updated in 2006) which provides that no action for trespass or nuisance can be taken as long as an aircraft observes the rules of the Air and Air Traffic Control Regulations, which also cover ground movements. The Act does provide the Government with:

- The power to designate areas where aircraft are not allowed to fly, but this is usually done only on safety or security grounds, for instance over high security prisons or sensitive installations.
- A number of provisions for controlling noise through a process of airport “designation”, which to date has only been applied to Heathrow, Gatwick and Stansted Airports. This enables the Secretary of State or a nominated representative, through the Civil Aviation Act 1982 Section 78 paragraph 1, to publish notices outlining the *"requirements appearing to the Secretary of State to be appropriate for the purpose of limiting or of mitigating the effect of noise and vibration connected with the taking off or landing of aircraft at the aerodrome."*

In practice, noise restrictions at these designated airports have been implemented through operational restrictions such as controls on departing aircraft noise levels, the Noise Preferential Routes (NPRs), the night flight management program and (at Heathrow and Gatwick, under Section 79) housing noise insulation schemes.

In addition to the Civil Aviation Act, the Environmental Noise (England) Regulations 2006 align with the Government’s aim – as set out in the Aviation Policy Framework (aligned with the ICAO initiative) – to adopt a balanced approach to securing the benefits of aviation. This is underpinned by two core principles:

- **Collaboration:** By working together with industry, regulators, experts, local communities and others at all levels, the industry will be better able to identify workable solutions to the challenges and share the benefits of aviation in a fairer way than in the past.
- **Transparency:** To facilitate improved collaboration, it is crucial to have clear and independent information and processes in place. Those involved in and affected by aviation need to have a clearer understanding of the facts and the confidence that proportionate action will be taken at the international, national, or local level.

In addition, through a preference of several Westminster Governments for local resolutions, the Section 106 obligation has become a supplementary tool for managing noise. This agreement between the Local Authority and the airport can agree requirements with regards to noise management in the process of granting planning permission.

However, as an international industry noise management cannot be isolated to a single country and noise management programs are always coordinated with nearby states and internationally through ICAO, with these outlined in Section 5.

It is important to note that the Department for Transport is currently executing a program of policy review, seeking to update its aviation policy to address a broad range of challenges in the aviation industry and proposes seven key themes including how to ensure aviation can continue to grow sustainably. It notes that "*Achieving sustainable growth requires a partnership between the Government, the regulator, the industry and other interested parties to work within a comprehensive policy framework to better manage the environmental impacts of the sector*" ([UK Government, 2018](#)).

### European and International approaches

At 23:00 on 31 December 2020 the UK left the European Union aviation system and as such is no longer part of European Union aviation institutions, including the European Aviation Safety Agency (EASA). Since leaving the EU, the CAA has incorporated a number of EU Aviation Laws into UK Aviation Laws, once such being EU Regulation 598/2014, incorporated in UK law within CAP 2061A00: Noise - Regulation (EU) 598/2014. ([DfT, 2019](#); [CAA, 2021a](#))

The regulation establishes the rules and procedures on the introduction of noise-related operating restrictions at major airports (defined as one with more than 50,000 civil aircraft movements per calendar year) within the balanced approach to noise management, outlined by the International Civil Aviation Organisation (ICAO).

As a specialised agency of the United Nations, ICAO fosters the planning and development of international air transport to ensure safe and orderly growth. Noise management forms part of that and once a position has been discussed and agreed through that global coordination, under the Convention on International Civil Aviation, Member States are required to adopt that position within their region. Consequently, ICAO's balanced approach has been adopted by the EU with Regulation 598 and by the UK in UK legislation ([ICAO, 2008](#)).

The balanced approach itself is built around four principles, outlined in the text below (see also Figure 1).

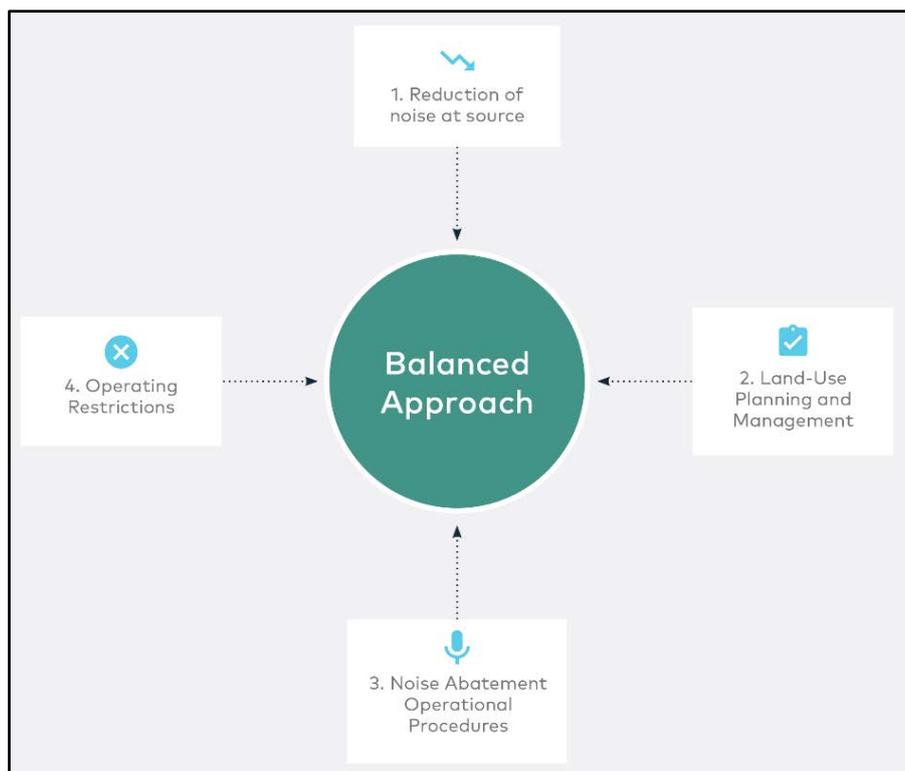


Figure 1: The ICAO Balanced approach (ICAO, 2008)

- **Reduction of noise at source**, aircraft noise is generated by a number of different sources and through the work of ICAO and the development of the aircraft chapter standards, the industry has invested heavily in Research and Development to continually reduce the noise impact of aviation.
- **Land use planning and management** covers a wide range of measures aimed at improving the noise climate around airports. The most effective long-term options include the definition of noise zones in which there are restrictions on residential and other noise sensitive property development, and these are used widely in the UK and across Europe.
- **Noise abatement operational procedures** relate to how aircraft can be operated in different ways to reduce the impact of noise on a local community. Examples in the UK and Europe include continuous descent approach (CDA), noise preferential routes (NPRs) and departure noise limits.
- **Operating restrictions** may be necessary for some airports where noise mitigation is required, and other methods prove to be ineffective. Strict rules (outlined in EU Regulation 598/2014, incorporated in UK law within CAP 2061A00: Noise - Regulation (EU) 598/2014) apply for the introduction of operating restrictions to ensure fair competition internationally and maintain the efficiency of the aviation network.

In addition to the regulatory regime, much like the CAA and Sustainable Aviation in the UK, in the European arena, Eurocontrol has worked over several years with many stakeholders, including airlines, airports and air navigation service providers, on environmental measures and have published a CCO/CDA Action Plan ([Eurocontrol, 2020a](#)). At the time of writing, the UK remains a Member State within Eurocontrol.

The Action Plan includes practical advice on how to make CCO/CDA work, with examples of best practices and how constraints can be overcome, building on the extensive experience Europe already has on optimising the efficiency of vertical flight profiles. Page 22, in Appendix Q, of the case study document details the success of the designated London airports in improving CDA attainment and some of the tools available to airports to achieve this ([Eurocontrol, 2020b](#)).

## Appendix II: Other

### The Civil Aviation Authority

In addition to the Department for Transport, the UK CAA's primary role is the safe conduct of aviation and it notes its vision in this area as "*Making aviation better for those who choose to fly and those who do not*" ([CAA, 2015](#)).

A key element of this approach is the dedicated noise department, Environmental Research and Consulting Department (ERCD) which provides a range of research and advisory services in the field of aviation and the environment. Often leveraging the data collected by the various local airports in their noise and track keeping systems to provide data-driven analytics, including the production of annual noise exposure contours for Heathrow, Gatwick and Stansted, as well as for other regional airports and local authorities in the UK. ERCD has developed, and maintains, a computer noise prediction model which has been validated by ICAO. The department has also produced numerous reports going back to the 1970's and these can be accessed on their website. ERCD also conduct specific studies to inform the Department for Transport on an ad-hoc basis ([CAA, 2021b](#)).

### Sustainable Aviation Industry Group

Within the UK, Sustainable Aviation was established in 2005 and consists of a group of industry partners whose long-term strategy sets out the collective approach of UK aviation to tackling the challenge of ensuring a cleaner, quieter, smarter future for the aviation industry. The group has produced many reports and recommendations since its inception, key amongst them are the arrival and departures "Code of Practice" documents:

- The Arrivals Code of Practice was published in 2002 and revised in 2006 ([Sustainable Aviation, 2006](#)). Using the experience and knowledge of all participants, the second edition of the Code of Practice was produced to identify steps which could reduce the noise generated by arriving aircraft. As a result, the Code is a technical document which is primarily written for pilots and air traffic controllers, but it also includes advice to relevant parties such as airports and the regulator.
- The Departures Code of Practice was published in 2012 and was compiled by a group representing aerospace manufacturers, airlines, airports, air traffic control (ATC) and the Civil Aviation Authority's Environmental Research and Consultancy Department (ERCD) ([Sustainable Aviation, 2012](#)). It gives advice on four operational techniques aimed at improving the environmental impacts of aircraft operations during the ground operations and departure phases of flight, and includes the use of Fixed Electrical Ground Power (FEGP) and Preconditioned Air (PCA) rather than running aircraft Auxiliary Power Units (APUs); taxi with less than all engines operating; Continuous Climb Operations (CCO); and Airport Collaborative Decision Making (A-CDM)

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